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Global liquidity, global risk appetite, and the risk of credit and asset booms

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This study examines the channels through which net cross-border bank flows and VIX, working through the domestic banking system, could potentially lead to the creation or exacerbation of credit and asset booms that may threaten financial stability. It uses bank firm-level data for the Philippines over the period 1991-2018. Among the study's significant findings are the following: bank lending to the real estate and housing sector is consistently and significantly affected by net cross-border bank flows (NCBF); non-core bank liabilities is an important variable as it consistently affects the amount of total loans and loans to the commercial and industrial sector as well as bank asset growth and bank leverage; net cross-border flows lower bank asset growth; and banks' cost of loans tends to be reduced by NCBF and by a reduction in global risk appetite. The use of macroprudential measures-including monitoring bank non-core liabilities and lending to sectors such as real estate-as well as capital flow management measures is warranted in order to prevent bank credit and asset booms from being created or exacerbated, which may threaten growth and financial stability.

JEL classification: E4, E5, E6, F3, F4, F6
Keywords: asset booms, credit booms, financial stability, cross-border bank flows, VIX, bank firm-level data

1. Introduction

Changes in global liquidity and risk appetite transmitted across national borders in an era of increased integration of financial markets have become an important channel of external shocks to an economy and pose a challenge to the conduct of monetary policy and the stability of the financial system. For example, Baskaya et al. [2017] find an important international credit channel through

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which capital inflows and domestic bank borrowing from abroad, especially by larger, stronger capitalized banks, affect domestic bank credit supply in the case of Turkey.

With greater capital mobility across national borders, central bankers are constantly on guard against possible inflationary effects of such inflows, and potential implications on financial stability, given the potential of capital inflows to create or exacerbate credit and asset booms, and busts when such flows reverse. Using data over the period 1870-2008, Shularick and Taylor [2012:1032], conclude that financial crises are essentially "credit booms gone wrong", as lagged credit growth is a significant predictor of financial crises while other variables are not.

Capital inflows, especially cross-border bank inflows in bank finance-dependent economies, tend to create large imbalances in both bank and non-bank firm balance sheets, and induce behavior that tends to take advantage of the availability of cheap credit, including increased leverage and the downplaying of risk. A recent study by Brauning and Ivashina [2018], for example, finds that the volume of credit in EMEs is directly affected by foreign bank lending to firms there, with a 32 percentage-point increase in the volume of such loans when US monetary policy eases. Bank and non-bank firms may be more willing to take on debt and increase their leverage ratios in order to acquire assets when cheap and abundant funding is available. The temptation to do so may arise partly because the risks of illiquidity and credit defaults are downplayed when large capital inflows and rising asset values boost balance sheets. Greater bank balance sheet imbalances which fuel asset and credit booms may set the stage for a potential financial collapse down the road a la Minsky.

The effects of financial crises are oftentimes not confined to the financial sector alone and may adversely impact the real economy. Cecchetti [2008] and Gochoco-Bautista [2008; 2009] find that asset booms raise the tail risks of both bad output and inflation outcomes. In addition, Gochoco-Bautista [2000] also finds that excessive credit is associated with currency depreciation pressure periods in countries such as the Philippines.

Thus, in general, central bankers today regard large and volatile capital flows associated with changes in global liquidity, global risk appetite, and the intermediation of these through domestic banking systems, as matters that need to be dealt with decisively and in a timely manner. Furthermore, they realize that these cannot be simply left to private market participants alone to deal with. This is especially so in the case of emerging economies which typically do not have deep nor mature financial systems to efficiently intermediate such flows. The IMF itself has had a change of heart regarding unbounded capital mobility in the aftermath of the Asian Financial Crisis, allowing the use of so-called "capital management measures" to deal with large and volatile capital inflows, but only almost as a last resort.

This study uses bank firm-level data for the Philippines over the period 1991-2018 to understand the channels through the domestic banking system by which capital inflows and VIX[1] can potentially give rise to credit and asset booms. The Philippines is a small, open economy with a financial structure that is heavily bank dependent. Like many developing economies, a bank-dependent financial structure exists alongside a large informal financial sector. The formal financial sector is dominated by a few large universal banks through which most capital inflows are intermediated, if they enter the formal financial sector.[2]

In particular, this study examines some channels of transmission of capital flows to the banking sector at a more micro level, via changes in the cost of bank loans—or the average interest paid on bank loans, the total quantity of bank loans, and bank loans to the commercial and industrial sector and to the housing and real estate sector. It draws inspiration from a study by Baskaya, di Giovanni, Kalemli-Ozcan, and Ulu [2017a], which uses a matched firm-bank-loan level dataset for Turkey to explain the role of the global factor VIX, used as an instrument for capital flows, on real borrowing rates and domestic credit growth at the firm level.

While the current study does not have as ideal a dataset for the Philippines, one advantage that it has over the Baskaya et al. [2017a; 2017b] is that it is able to examine the relationship between net cross-border bank flows (NCBF), global risk appetite, proxied by VIX, and lending to specific sectors, such as the housing and real estate sector. Lending to the real estate sector, a non-tradeable goods sector, tends to have an adverse impact on financial stability because of the potential for asset booms being created as shown in Cecchetti [2008] and Gochoco-Bautista [2008; 2009]. It is also able to see whether VIX is a good proxy for capital flows and the global financial cycle compared with NCBF.

The study is divided into the following sections: Section 2 is a review of the literature on asset booms, the channels of effects from global liquidity and global risk appetite to an economy through the creation of asset and credit booms and busts and the implications on financial stability, and the possible implications for the conduct of monetary policy; Section 3 describes the data and discusses the empirical methodology; Section 4 presents and discusses the empirical results obtained; and Section 5 concludes.

[1] VIX is the Chicago Board Options Exchange's volatility index measuring expectations of stock market volatility based on S&P 500's stock options.

[2] There are also rural banks in the formal banking sector, but these do not intermediate capital inflows from abroad. The stock market is not a significant source of financing investment. The Philippines receives about 30 billion US dollars in remittances from overseas workers annually. Most of these are used to support consumption demand and consumption smoothing.

2. Literature review

One difficulty in ascertaining the genesis of asset booms is that the literature has not arrived at a universally-accepted definition of what an asset boom is, nor whether it is caused by changes in certain fundamental factors or is the result of irrational exuberance. There is also little consensus on whether there is any usable information to be gleaned from asset booms, however defined. In the past, the criteria for 'usable' information tended to be limited to any information inferable from asset booms that directly impacted the average rate of inflation forecasts as in Bernanke and Gertler [2000], for example.

Despite these unsettled issues, there does seem to have been a sea change in attitude about the wisdom of not ignoring large changes in asset prices and credit growth. There are studies that demonstrate the less-than-benign effects of asset booms on the economy and on financial stability. Cecchetti [2008] and Gochoco-Bautista [2008; 2009], for example, show that asset prices contain useful information to assess the tail risks of the worst output and inflation outcomes that monetary authorities ought to pay attention to, and that does not require the classification of movements in asset prices as being indicative of asset booms.

Studies have examined the channels of transmission of global liquidity and risk appetite shocks to an economy. Rey [2015], for example, finds evidence relating the co-movement of capital flows and asset prices, bank leverage, and domestic credit, to a global financial cycle proxied by VIX. Changes in VIX reflect changes in global risk appetite of global investors which drive capital inflows to EMEs in a global chase for higher yields, in large part as a reaction to zero-lower bound interest rates in countries such as the US and Japan and in Europe in the aftermath of the GFC. A Bank for International Settlements (BIS) study [2014] also finds that the co-mingling of global factors with domestic factors has become a more important determinant of financial cycles, especially in Emerging Asia.

The availability of global liquidity may create large balance sheet imbalances and induce changes in the behavior of bank and non-bank firms in a way that may raise the risk of imprudent behavior, increase leverage ratios, create credit and asset booms, and give rise to financial vulnerability and crisis.

Bruno and Shin [2015] find evidence of the transmission of global liquidity and financial conditions through the effects of cross-border bank flows on the leverage cycle of international banks which propagates global liquidity. Adrian and Shin [2010] examine the behavior of bank leverage in relation to asset price increases. They explain that if bank leverage moves pro-cyclically when asset prices are rising, then such behavior enhances business cycle effects. Output booms will be larger when assets are growing alongside bank leverage, exacerbating the boom. The converse case is true. Gochoco-Bautista [2016] finds that bank leverage does not behave pro-cyclically in response to a low VIX or equivalently, a high global risk appetite, and that specific kinds of flows are responsible for the growth in bank leverage. Merely having large capital flows or equity flows does not lead to growth in bank leverage. The worrisome aspect of portfolio flows significantly

explaining the growth in bank leverage is that since portfolio flows are short-term, they are easily reversible flows. This could leave more leveraged banks without continuing funding sources when portfolio flows stop or reverse. Furthermore, results indicate that the growth of bank leverage is also more sensitive to VIX when portfolio flows are considered.

The availability of large sources of non-core funding from global wholesale markets may provide the rope that allows banks and non-bank firms to hang themselves with. Borio and Lowe [2004], Hahm et al. [2012], Kim et al. [2013], Baskaya et al. [2017a; 2017b] point out that banks often turn to non-core liabilities driven by banks' foreign exchange borrowing but which are a less stable source of funding. It is an indicator of greater financial vulnerability when credit growth exceeds bank core deposit growth. Kim et al. [2013] find evidence of a sharp increase in non-financial corporate deposits in China, Korea, and the Philippines associated with large offshore corporate bond issuance. Similarly, Hahm et al. [2013] use a credit supply model to model a lending boom, in which the vulnerability to crisis is seen in a large stock of non-core liabilities to finance bank lending in a panel of emerging and developing economies.

Lagos and Zhang [2018] focus on another channel of influence relating monetary policy to financial markets, especially asset prices. When monetary policy is tight, payments instruments such as bank reserve and money balances used in settling financial transactions become scarce. This makes financial assets more illiquid and reduces their resale value option and their price, which they refer to as a "turnover-liquidity mechanism" of monetary policy. [Lagos and Zhang 2018:2]. In short, this is a channel in which less liquidity in financial markets reduces asset prices. This liquidity-based mechanism is offered to explain a negative correlation between real stock returns and increases in the nominal interest rate.

Cecchetti [2008] and Gochoco-Bautista [2008; 2009] find that asset booms in housing and equity markets, but especially in the former, raise the risk of extreme outcomes, with the risk of real output-and price level-gaps being in the tails of worst outcomes of their distributions. The finding that housing booms are more pernicious relative to equity market booms may be due to the role of bank finance in financing home purchases. This is not the case for equity market purchases. There are important examples of the disastrous effects of housing booms and busts in the not-too-distant past. The prolonged deflationary process in Japan following the bursting of its housing bubble in the early 1990s and the drag on economic growth, for example, continues to this day. More recently, the collapse of housing prices in the US and in the value of sub-prime mortgage securitized assets led to a global financial crisis.

The effects of asset booms on the economy and on financial stability have spawned a large debate as to whether monetary policy needs to be pro-active and act pre-emptively, use macro-prudential measures, etc. to prevent the formation of asset booms as in Cecchetti et al. [2000], or whether monetary policy should

simply be reactive, as in Bernanke and Gertler [2000]. Despite many unsettled issues, central bankers today no longer regard financial stability as the natural by-product of a successful inflation strategy alone and recognize the perils of ignoring large changes in credit and asset growth. Gochoco-Bautista and Bautista [2005], for example, find that contracting domestic credit growth and raising the interest rate differential does work to reduce exchange market pressure in the Philippines, and that in crisis periods, monetary authorities in the Philippines responded to exchange market pressure by reducing domestic credit growth and did not engage in sterilization as was usually done under non-crisis periods.

A further complication is that as Rey [2015] explains, the existence of the global financial cycle no longer affords monetary authorities absolute monetary policy independence via a floating or flexible exchange rate regime in a world with free capital mobility, as conventionally thought. Asset prices, capital flows, and credit flows evidently obey global factors via the global financial cycle, but this cycle is typically not in sync with business and financial cycles in individual countries. Thus, Rey concludes that the "trilemma" is reduced to a "dilemma" in that an independent monetary policy is only possible if and only if the capital account is managed.

Responses of monetary authorities to large capital inflows themselves have implications on the interaction of global and domestic factors in affecting financial cycles and the potential for credit and asset booms to occur. Filardo and Siklos [2013], for example, provide evidence that large interventions by monetary authorities in the foreign exchange market in response to large cross-border capital flows have implications on asset booms in Emerging Asian economies. Asset booms tend to occur alongside large and persistent accumulation of reserves by central banks.

3. Data and methodology

This study considers the possible channels of effects from capital inflows through the banking sector to the cost of bank loans as well as to the amount of loans extended by banks for the purpose of lending to commercial and industrial firms, and the real estate and housing sector, as these could create credit and asset booms in these sectors.

As Baskaya et al. [2017a] explain, whether capital inflows lead to asset booms is confounded by both effects arising from the supply side and/or the demand side. The channels by which global liquidity and risk appetite spill over to a small open economy's domestic credit conditions, for example, are unclear and changes in global liquidity tend to have varied effects.

In their study, VIX, the usual proxy for global risk appetite, is used as an instrument for push-driven capital inflows whose movements are exogenous to domestic fundamentals in a small open economy. Assuming country risk can be decomposed into global risk and country-specific risk, when VIX is low, global

risk appetite is high, and country risk will tend to decline, *cet. par.* In this way, VIX is an instrument for and will capture supply-driven capital inflows. Movements in domestic fundamentals, such as Gross Domestic Product (GDP), exchange rates, and inflation are controlled for, as they are assumed to be correlated with the demand for capital inflows.

An alternative explanation, this time from the demand side, is that a low VIX and greater global risk appetite raises expectations of future economic conditions, which have wealth effects or balance sheet effects and affect firm demand for credit. A decline in VIX may lead firms and banks to expand their balance sheets and demand more credit. If so, the amount and cost of firm-level borrowing will rise when VIX is low.

The methodology therefore needs to take into account the fact that loan demand and bank lending rates are driven by both the demand for and supply of credit. Capital flows affect both the demand and supply sides of credit and have opposing effects on the price of credit.

Following Baskaya et al. [2017a], we use a reduced form regression to examine the impact of VIX on loans and the cost of loans using panel data for Philippine banks in the period 1991 to 2016. The dependent variable is either quantity of bank loans extended or the cost of such bank loans. The explanatory variables include either VIX or cross-border bank flows, bank characteristics such as assets, capital ratio, liquidity ratio, non-core liabilities ratio, return on bank assets (ROA) and a set of macro control variables including real GDP growth, inflation, and the exchange rate.

The general form of the equation estimated by the study is

$$\log Y_{b,t} = a + \beta \log M_{t-1} + \theta_1 Bank_{b,t-1} + \theta_2 Macro_{t-1} + \varepsilon_{b,t}$$

where for bank b and time t, we have:

Y	is either (i) quantity of loans extended by banks in total, or lent to the commercial and industrial sector, or lent to the real estate and housing sector or (ii) the price at which banks' loans are extended,
M	is either *NCBF* (net change in cross-border bank flows) or *VIX*
Bank	is a set of bank characteristics including assets, capital ratio, liquidity ratio, non-core liabilities ratio, and ROA
Macro	is a set of macro control variables including real GDP growth, inflation and the exchange rate

Another set of regressions were run to explain bank asset growth and bank leverage using the rest of the same explanatory variables. A lag length of 1 is used in all regressions.[3]

[3] The Arellano-Bond GMM procedure does not require a search for the optimal lag length using conventional measures.

Bank exposure to international financial markets may affect the way changes in global financing conditions spill over into domestic credit markets. Baskaya et al. [2017a; 2017b] ask whether changes in the measure of capital inflows have a larger impact on loan level and borrowing rate when credit is supplied by banks with higher non-core funding, and hence with funding mostly raised in international capital markets.

Hence, we would expect that bank lending more dependent on non-core liabilities will be more responsive to capital inflows. When VIX is low and therefore, global risk appetite is high, banks funding costs tend to decrease, and they can pass this on to firms by lowering firms' borrowing costs. Firms will tend to borrow more at a lower cost of borrowing. There is a supply-side associated domestic credit boom as seen in domestic loan growth and pricing associated with capital inflows proxied by VIX.[4]

In this study, a dynamic generalized method of moments (GMM) procedure due to Arellano and Bond [1991] is used to obtain efficient estimates when a regression has both endogenous and exogenous explanatory variables.

First, a regression is estimated explaining the cost of loans (measured by the ratio of interest and fees on loans to total loans) as a function of the amount of net change in cross-border bank flows (NCBF), bank assets, bank leverage, liquidity ratio, non-core liabilities, ROA of banks, GDP growth, inflation, peso depreciation, and lagged values of these.

Second, a similar regression is estimated using quantities or values of various loan variables as the dependent variable, such as the value of total banks loans, the amount of bank loans to the real estate and housing sector, and the amount of bank loans to the commercial and industrial sector.

These regressions are then re-estimated using VIX in place of net cross-border bank flows as an explanatory variable.

The next sets of regressions attempt to examine the behavior of bank asset growth and bank leverage. As in the previous case, the regressions are also re-estimated using VIX in place of net cross-border bank flows as an explanatory variable.

3.1. Data

Annual data covering the period 1991-2018 are taken from Datastream/ Worldscope, International Financial Statistics (IFS), Bank for International Settlements (BIS), and the Bangko Sentral ng Pilipinas (BSP). There are 29 banks in the data set. The list below presents the descriptive statistics of the data used in the study. All the variables, except those in ratios, are in real terms, deflated by the GDP deflator.

[4] Baskaya et al. [2017a] also examine whether different types of firms, e.g., more versus less-credit constrained firms as proxied by firm size or net worth, are differentially affected by lending by banks with high non-core liabilities when VIX is low. They also test whether there is a difference in changes in the amount of foreign- and domestic-currency loans by high non-core banks when VIX is low.

The variable names are listed below. Those with an asterisk are variables constructed using existing data.

Bank firm data

Interest and fees on loans
Total loans
*Cost of loans =Interest and fees on loans/Total loans
Pre-tax income
Income taxes
Net income of banks=Pre-tax income-Income taxes
Total assets
*ROA of banks=Net income/Total assets
Cash=Cash and due from banks
*Core liabilities=Demand Deposits + Savings and Time Deposits
*Liquidity ratio=Cash /Core liabilities
Total liabilities
*Non-core liabilities=Total liabilities-Core liabilities
Demand Deposits
Savings and Time deposits
Total liabilities plus shareholder equity
*Shareholder equity=Total liabilities plus shareholder equity-Total liabilities
*Bank leverage=Total assets/Shareholder equity
Commercial and industrial loans
Real estate/mortgage loans
Total loans

Other macro data

VIX
GDP, seasonally-adjusted
Inflation
Peso depreciation

Net cross-border flows or claims (NCBF) is the difference between foreign exchange and break-adjusted change in total claims[5] and total liabilities (as calculated by the BIS) of institutions in all reporting countries to banks in the counterparty country which in this study is the Philippines. The series used in the regressions is converted to domestic currency and deflated by the GDP price index.

[5] The source of data is https://stats.bis.org/statx/srs/table/a6.1. A claim as defined in the BIS website is a financial asset that has a counterpart liability and which excludes financial derivatives (https://www.bis.org/statistics/glossary.htm?&selection=230&scope=Statistics&c=a&base=term).

With 29 banks and 28 years of observations, the total sample is 812. The available set of observations for analysis, however, is much smaller because the sample banks differ in entry and exit periods. The number of observations, *N*, is shown in the last column of the Table 1 below.

TABLE 1. Descriptive statistics full sample 1991-2018

	Mean	Std Dev	Min	Max	*N*
Bank Data					
Return on Assets (%)	2.0	37.4	–220.3	764	475
Asset Growth (real, %)	6.0	37.8	–429.3	502	450
Leverage (%)	151.5	914.0	–53.9	14,032	470
Liquidity Ratio (%)	17.2	9.6	2.9	73	407
Non-Core Liabilities (₱ mil)	34.5	54.8	0.4	379	409
Commercial/Industrial Loans (₱ mil)	113.7	220.0	0.0	1,281	228
RE & Mortgage Loans (₱ mil)	34.7	45.9	0.0	291	205
Total Loans (₱ mil)	150.5	266.1	0.0	2,020	411
Cost of Loans (real, %)	3.8	2.9	–4.6	21	388
Macroeconomic Data					
Depreciation Rate (%)	2.41	8.69	–10.6	32.8	27
Inflation Rate (%)	4.86	2.32	0.61	9.88	27
GDP Growth (%)	4.56	2.05	–0.58	7.36	27
Cross-border bank claims, (NCBF, US$ bil)	–0.25	2.96	–6.07	7.97	28
CBOE Volatility Index	19.8	8.57	11.2	43.3	28

4. Results

4.1 Highlights of results in Tables 2A-3B

Tables 2A and 2B show the regression results in which either the cost of loans—a measure of the interest rate charged on bank loans—or the quantity of loans in total as well to either the real estate sector or the commercial and industrial sector is the dependent variable, and various regressors including net cross-border bank inflows (NCBF) as the indicator of global liquidity. Tables 3A and 3B are the same regressions except that VIX is used in place of NCBF as the indicator of global liquidity. Regressions without crisis dummies for the Asian Financial Crisis and Global Financial Crisis periods are in the A tables while those with such dummies are in the B tables.

TABLE 2A. Crossborder regressions (cost and quantity of loans)

	Cost of loans	Total loans	Com/Ind loans	RE & Mort loans
Net Change in Cross Border Claims	–0.214	–0.057	0.506	0.876+
	(0.559)	(0.068)	(0.317)	(0.493)
Net Change in Cross Border Claims (–1)	–0.796+	0.043	–0.331	–0.425+
	(0.418)	(0.064)	(0.374)	(0.240)
Leverage	–0.101	–0.075*	0.077	–0.222*
	(0.161)	(0.033)	(0.074)	(0.109)
Leverage(–1)	0.396+	0.066+	–0.258	–0.07
	(0.205)	(0.034)	(0.179)	(0.133)
Liquidity Ratio	0.874**	–0.149**	–0.006	0.250*
	(0.315)	(0.031)	(0.188)	(0.114)
Liquidity Ratio(–1)	–0.585**	0.192**	0.187	0.062
	(0.141)	(0.026)	(0.134)	(0.177)
Return on Assets	0.133	0.011	0.331	0.301*
	(0.150)	(0.020)	(0.324)	(0.124)
Return on Assets(–1)	–0.164	0.042*	–0.203	–0.368**
	(0.153)	(0.016)	(0.265)	(0.061)
Non–Core Liabilities	–0.756+	0.304**	–0.025	–0.036
	(0.406)	(0.065)	(0.223)	(0.422)
Non–Core Liabilities(–1)	0.223	–0.257**	0.551+	0.311
	(0.439)	(0.062)	(0.301)	(0.476)
GDP Growth	0.425**	0.009	0.025	0.114
	(0.047)	(0.007)	(0.055)	(0.090)
GDP Growth(–1)	0.047	0.009	0.032	0.175+
	(0.075)	(0.006)	(0.054)	(0.105)
Depreciation Rate	0.143**	–0.003*	0.013	0.006
	(0.010)	(0.002)	(0.015)	(0.011)
Depreciation Rate(–1)	–0.006	–0.002	–0.001	0.016
	(0.016)	(0.001)	(0.012)	(0.018)
Inflation Rate	–0.469**	–0.009*	0.021	0.042
	(0.041)	(0.004)	(0.035)	(0.062)
Inflation Rate(–1)	0.705**	0.016*	0.056	0.137
	(0.059)	(0.007)	(0.037)	(0.143)
Cost of Loans(–1)	0.438**			
	(0.066)			
Total Loans(–1)		0.938**		
		(0.035)		
Commercial/Industrial Loans(–1)			0.442**	
			(0.140)	
RE & Mortgage Loans(–1)				0.625**
				(0.040)
AC(1) test: z–stat(p–value)	–3.29(0.001)	–2.92(0.004)	–1.62(0.104)	–1.50(0.134)
AC(2) test: z–stat(p–value)	–0.81(0.416)	–0.63(0.529)	–0.08(0.938)	–1.09(0.275)
#Observations	311	321	170	148

TABLE 2B. Cross border regressions with dummies (cost and quantity of loans)

	Cost of loans	Total loans	Com/Ind loans	RE & Mort loans
Net Change in Cross	0.014	–0.079	0.455	0.863+
Border Claims	(0.528)	(0.070)	(0.298)	(0.488)
Net Change in Cross	–0.456	0.009	–0.586	–0.488
Border Claims (–1)	(0.429)	(0.061)	(0.448)	(0.328)
Leverage	–0.143	–0.070*	0.084	–0.215+
	(0.164)	(0.034)	(0.082)	(0.117)
Leverage(–1)	0.419*	0.066+	–0.266	–0.078
	(0.210)	(0.035)	(0.187)	(0.142)
Liquidity Ratio	0.767**	–0.141**	–0.037	0.228*
	(0.297)	(0.029)	(0.189)	(0.115)
Liquidity Ratio(–1)	–0.569**	0.189**	0.244+	0.075
	(0.162)	(0.027)	(0.144)	(0.200)
Return on Assets	0.130	0.01	0.297	0.285*
	(0.158)	–0.021	–0.325	–0.113
Return on Assets(–1)	–0.217	0.047**	–0.199	–0.364**
	(0.160)	(0.018)	(0.265)	(0.060)
Non–Core Liabilities	–0.606	0.289**	–0.055	–0.06
	(0.386)	(0.067)	(0.251)	(0.448)
Non–Core Liabilities(–1)	0.097	–0.249**	0.567+	0.33
	(0.420)	(0.064)	(0.316)	(0.496)
GDP Growth	0.445**	0.009	0.001	0.123
	(0.046)	(0.008)	(0.051)	(0.093)
GDP Growth(–1)	0.006	0.012+	0.02	0.177
	(0.083)	(0.007)	(0.048)	(0.109)
Depreciation Rate	0.135**	–0.002	0.001	0.007
	(0.010)	(0.002)	(0.011)	(0.010)
Depreciation Rate(–1)	–0.005	–0.002+	–0.006	0.012
	(0.014)	(0.001)	(0.014)	(0.016)
Inflation Rate	–0.595**	–0.005	0.016	0.042
	(0.039)	(0.004)	(0.030)	(0.063)
Inflation Rate(–1)	0.687**	0.019**	0.028	0.129
	(0.055)	(0.006)	(0.029)	(0.133)
Cost of Loans(–1)	0.436**			
	(0.068)			
Total Loans(–1)		0.943**		
		(0.034)		
Commercial/Industrial			0.446**	
Loans(–1)			(0.136)	
RE & Mortgage Loans(–1)				0.626**
				(0.039)
Crisis Dummy	0.848**	–0.071+	–0.323	–0.076
	(0.234)	(0.037)	(0.290)	(0.176)
AC(1) test: z–stat(p–value)	-3.21(0.001)	–2.95(0.003)	–1.61(0.108)	–1.47(0.142)
AC(2) test: z–stat(p–value)	-0.39(0.697)	–0.55(0.583)	0.02(0.984)	–1.11(0.268)
#Observations	311	321	170	148

Note: standard errors in parentheses (+ $p<0.10$, * $p<0.05$, ** $p<0.01$)

On the average cost of bank loans—measured as interest and fees on loans divided by total loans—Table 2A shows that the coefficient on lagged NCBF has a significant and negative effect on the cost of bank loans but only when no crisis dummy is used. This implies that when net cross-border bank claims increase, the price of credit or the average interest rate on bank loans, declines. This is possible if more cross-border bank flows increase the supply of bank loans lowering their cost. If cross-border bank flows come in because of greater growth prospects in the economy, raising the demand for bank loans, and this effect dominated the increased supply of bank loans, one would expect to see a significant and positive coefficient on lagged NCBF instead. But we do not observe this here.

When VIX is used instead, the result in Table 3A shows that the coefficient on VIX is positive and significant but again, only when no crisis dummy is used. The cost of bank loans is sensitive to this global factor likely through a supply channel as well, i.e., when VIX is high and risk appetite is low, capital inflows decline, banks have less funds to loan out, and the price of credit rises. It could also be that when risks are higher and risk appetite is low, banks charge a higher interest rate on bank loans to incorporate the higher risk premium. Perhaps adding to pro-cyclicality in which banks contract lending when the economy is down and risk is high, thereby exacerbating a recession, is that banks may feel that they will not be held liable for failing to provide loans and ample liquidity in a recession. Central bank responses, which typically require setting aside more capital and loan-loss provisioning in a recession, also exacerbate a recession.

The results in Tables 2A, 2B, 3A, and 3B show that the coefficient on lagged bank liquidity is significant and negative at first and then significant and positive on the cost of bank loans, regardless of whether NCBF or VIX is used in the regression or whether a crisis dummy is used or not. This implies that while there is initially a liquidity effect, such that when banks have a lot of liquidity, the cost of bank loans falls, this liquidity effect is reversed and the cost of bank loans increases.

Table 2B shows that the coefficient on the crisis dummy is significant in regressions explaining the cost of bank loans, regardless of whether VIX or NCBF is used as an explanatory variable and in one regression explaining total bank loans when NCBF is used. A crisis increases the cost of bank loans and reduces the amount of total bank loans.

The results in Tables 2A and 2B, show that bank loans to the real estate and mortgage sector increase contemporaneously when there are net cross-border bank inflows (NCBF) regardless of whether a crisis dummy is used in the regression or not. In contrast, NCBF does not have a significant effect on either total loans or loans to the commercial and industrial sector. The finding of a significant positive effect specifically on bank loans to the real estate sector, not other sectors, from cross-border bank flows may have adverse implications on financial stability given the link between bank lending and the potential creation of housing booms on the one hand, and financial instability on the other, as the booms go bust.

TABLE 3A.VIX regressions (cost and quantity of loans)

	Cost of loans	Total loans	Com/Ind loans	RE & Mort loans
Volatility Index	0.691**	–0.080**	–0.213	0.099
	(0.160)	(0.028)	(0.218)	(0.107)
Volatility Index (–1)	–0.142	–0.019	0.195+	0.392
	(0.198)	(0.029)	(0.101)	(0.341)
Leverage	–0.062	–0.075*	0.058	–0.207
	(0.165)	(0.034)	(0.075)	(0.132)
Leverage(–1)	0.335+	0.069*	–0.246	–0.09
	(0.197)	(0.034)	(0.177)	(0.155)
Liquidity Ratio	0.814*	–0.134**	–0.014	0.164
	(0.338)	(0.026)	(0.193)	(0.121)
Liquidity Ratio(–1)	–0.612**	0.179**	0.309	0.186
	(0.138)	(0.028)	(0.197)	(0.216)
Return on Assets	–0.016	0.015	0.297	0.283*
	(0.127)	(0.022)	(0.334)	(0.132)
Return on Assets(–1)	–0.085	0.043*	–0.192	–0.371**
	(0.142)	(0.018)	(0.276)	(0.075)
Non–Core Liabilities	–0.802*	0.297**	0.005	–0.1
	(0.402)	(0.066)	(0.230)	(0.484)
Non–Core Liabilities(–1)	0.345	–0.258**	0.513+	0.387
	(0.421)	(0.060)	(0.309)	(0.528)
GDP Growth	0.530**	–0.007	–0.001	0.211
	(0.057)	(0.009)	(0.089)	(0.141)
GDP Growth(–1)	0.003	0.014*	0.023	0.198
	(0.068)	(0.006)	(0.043)	(0.147)
Depreciation Rate	0.137**	–0.004*	0.004	0.018
	(0.009)	(0.002)	(0.018)	(0.013)
Depreciation Rate(–1)	–0.017	–0.001	0.002	0.016
	(0.012)	(0.001)	(0.012)	(0.022)
Inflation Rate	–0.539**	–0.014**	0.013	0.079
	(0.050)	(0.004)	(0.027)	(0.077)
Inflation Rate(–1)	0.705**	0.017**	0.054	0.182
	(0.054)	(0.006)	(0.038)	(0.182)
Cost of Loans(–1)	0.466**			
	(0.067)			
Total Loans(–1)		0.940**		
		(0.034)		
Commercial/Industrial Loans(–1)			0.441**	
			(0.139)	
RE & Mortgage Loans(–1)				0.628**
				(0.032)
AC(1) test: z–stat(p–value)	–3.21(0.001)	–2.87(0.004)	–1.59(0.111)	–1.47(0.142)
AC(2) test: z–stat(p–value)	–0.62(0.533)	–0.53(0.597)	0.34(0.737)	–1.10(0.271)
#Observations	311	321	170	148

Note: standard errors in parentheses (+ $p<0.10$, * $p<0.05$, ** $p<0.01$)

TABLE 3B.VIX regressions with dummies (cost and quantity of loans)

	Cost of loans	Total loans	Com/Ind loans	RE & Mort loans
Volatility Index	0.262	–0.066**	–0.208	0.042
	(0.187)	(0.023)	(0.209)	(0.109)
Volatility Index (–1)	–0.313	–0.013	0.187	0.528
	(0.233)	(0.029)	(0.120)	(0.388)
Leverage	–0.103	–0.074*	0.059	–0.225+
	(0.163)	(0.034)	(0.079)	(0.123)
Leverage(–1)	0.371+	0.069*	–0.248	–0.071
	(0.201)	(0.035)	(0.174)	(0.143)
Liquidity Ratio	0.755*	–0.132**	–0.019	0.229+
	(0.310)	(0.025)	(0.214)	(0.129)
Liquidity Ratio(–1)	–0.558**	0.179**	0.314	0.132
	(0.140)	(0.028)	(0.195)	(0.197)
Return on Assets	0.058	0.012	0.294	0.320*
	(0.140)	(0.021)	(0.344)	(0.139)
Return on Assets(–1)	–0.16	0.046*	–0.192	–0.375**
	(0.155)	(0.018)	(0.276)	(0.074)
Non–Core Liabilities	–0.653+	0.292**	0.001	–0.044
	(0.383)	(0.069)	(0.255)	(0.457)
Non–Core Liabilities(–1)	0.156	–0.254**	0.517+	0.334
	(0.407)	(0.063)	(0.312)	(0.501)
GDP Growth	0.445**	–0.004	–0.002	0.215
	(0.060)	(0.010)	(0.088)	(0.142)
GDP Growth(–1)	–0.047	0.015*	0.02	0.233
	(0.076)	(0.007)	(0.048)	(0.159)
Depreciation Rate	0.131**	–0.003+	0.003	0.022
	(0.010)	(0.002)	(0.017)	(0.015)
Depreciation Rate(–1)	–0.007	–0.001	0.001	0.03
	(0.011)	(0.001)	(0.016)	(0.027)
Inflation Rate	–0.595**	–0.012**	0.014	0.077
	(0.054)	(0.004)	(0.029)	(0.076)
Inflation Rate(–1)	0.658**	0.018**	0.052	0.214
	(0.062)	(0.006)	(0.046)	(0.194)
Cost of Loans(–1)	0.434**			
	(0.070)			
Total Loans(–1)		0.941**		
		(0.033)		
Commercial/Industrial Loans(–1)			0.441**	
			(0.139)	
RE & Mortgage Loans(–1)				0.625**
				(0.034)
Crisis Dummy	0.853*	–0.028	–0.024	0.247
	(0.333)	(0.036)	(0.269)	(0.161)
AC(1) test: z–stat(p–value)	–3.16(0.002)	–2.89(0.004)	–1.59(0.112)	–1.50(0.133)
AC(2) test: z–stat(p–value)	–0.48(0.632)	–0.55(0.582)	0.30(0.762)	–1.10(0.272)
#Observations	311	321	170	148

Note: standard errors in parentheses (+ $p<0.10$, * $p<0.05$, ** $p<0.01$)

The results in Tables 3A and 3B show that while none of the coefficients of VIX are significant in explaining bank loans to the real estate sector, the coefficient on contemporaneous VIX is significant and negative in the regressions in which total loans is the dependent variable, whether a crisis dummy is included or not. This implies that when VIX is high and risk appetite is low, banks reduce the amount of total loans they extend. This is consistent with a narrative in which there is a smaller amount of global liquidity flows into the domestic banking system and so the supply of loans declines, but it is also consistent with one in which the quantity of bank loans demanded declines when there is greater risk and which banks respond to by reducing the amount of loans extended.

In addition, the coefficient on lagged VIX is significant and is positive in Table 3A in the regression explaining loans to the commercial and industrial sector, but only when no crisis dummy is used. This result implies that an increase in VIX, or a fall in risk appetite, increases bank lending to the commercial and industrial sector. This is worrisome because it implies that even though risk appetite falls, banks increase lending to the commercial and industrial sector.

The coefficient on contemporaneous ROA is always significant and positive in the regressions explaining the amount banks loan to the real estate and housing sector, regardless of whether NCBF or VIX is used as an explanatory variable in the regression, and whether or not a crisis dummy is included. This is a robust finding as it holds regardless of the measure of global liquidity used. The coefficient on lagged ROA is always significant and negative in these regressions. This implies that higher bank profitability first reduces but this effect is reversed in the next period, increasing bank lending to the real estate and housing sector, and creating the potential for pro-cyclical housing booms.

The only other case in which ROA affects bank lending is the significant and positive coefficient on lagged ROA in regressions explaining the amount of total bank loans, regardless of whether NCBF or VIX is used in the regression and whether a crisis dummy is included or not. Again, this has a potential to create or exacerbate booms.

Bank liquidity—the ratio of a bank's cash to its core liabilities—seems to matter in the case of bank lending to the real estate and housing sector when NCBF is used as an explanatory variable, and when VIX is used as an explanatory variable but only when a crisis dummy is included. The coefficient on contemporaneous bank liquidity ratio is significant and positive. In addition, the coefficient on lagged bank liquidity is again significant and positive (although the coefficient on contemporaneous bank liquidity is significant and positive) in regressions explaining total bank loans, regardless of whether NCBF or VIX is used as an explanatory variable and whether a crisis dummy is used or not. This finding shows the potential for the creation credit and asset booms and affect financial stability when banks have high liquidity ratios.

In general, the quantity or value of total loans is affected by lagged bank leverage, lagged bank liquidity, and contemporaneous bank non-core liabilities in a significant and positive way. These raise the risk of potentially creating credit and asset booms and financial instability.

Of these, the results in Tables 2A, 2B, 3A, and 3B show that contemporaneous non-core liabilities consistently and significantly positively affect the value of total loans while lagged non-core liabilities have the same effect on loans to the commercial and industrial sector, regardless of whether NCBF or VIX is used in the regressions, and whether a crisis dummy is used or not. This finding, while robust, is disturbing since non-core liabilities are a less stable and usually more expensive way of sourcing bank funds. This finding of bank dependence on funding through non-core liabilities potentially raises the risk of financial instability.

The same tables show that the coefficient on lagged bank leverage is significant and positive in regressions with total bank loans as the dependent variable, regardless of whether crisis dummies are used or not, or whether NCBF or VIX is used in the regression explaining total bank loans. This seems to indicate pro-cyclical bank leverage-when leverage bank increases, bank loans or assets likewise increase—which would potentially fuel a boom. However, the coefficient on contemporaneous bank leverage is significant and negative, implying that any pro-cyclicality between bank leverage and bank lending is not sustained and reverses a year later.

4.2. Highlights of results in Tables 4A and 4B

The regressions in Tables 4A and 4B attempt to explain two aspects of bank behavior, namely, bank asset growth and bank leverage. The earlier results indicate that ROA is important in explaining the amount of loans to both the real estate and housing sector and to a lesser extent, total bank loans. Bank leverage, on the other hand, especially pro-cyclical bank leverage, is directly related to the propagation of asset booms and busts. Both may tell us something about the possibility of financial vulnerability or financial instability. The regressions in Table 4A include NCBF as an explanatory variable while those in Table 4B using VIX.

Table 4A shows that contemporaneous NCBF lowers bank asset growth. This finding shows that bank inflows impact domestic bank asset growth and tend to reduce it. To some extent, NCBF probably substitutes for bank loans. In contrast, none of the coefficients in the various regressions using VIX to explain bank asset growth are significant in Table 4B.

TABLE 4A. Cross border regressions (bank asset growth and leverage)

	Asset growth	Asset growth	Asset growth	Leverage	Leverage	Leverage
Net Change in Cross Border Claims	–0.088*	–0.192**	–0.197**	0.019	–0.678+	–0.146
	(0.036)	(0.060)	(0.073)	(0.107)	(0.403)	(0.260)
Net Change in Cross Border Claims(–1)	0.084*	0.034	0.032	0.01	0.01	–0.059
	(0.033)	(0.038)	(0.029)	(0.125)	(0.143)	(0.139)
Liquidity Ratio	0.049**	0.067**	0.016	–0.104+	–0.231**	–0.078
	(0.015)	(0.024)	(0.017)	(0.056)	(0.080)	(0.050)
Liquidity Ratio(–1)	–0.044**	–0.023	0.019	0.03	0.223*	0.079
	(0.016)	(0.019)	(0.027)	(0.058)	(0.093)	(0.072)
Return on Assets	–0.042**	–0.042	–0.018	–0.094*	–0.017	–0.071
	(0.012)	(0.031)	(0.029)	(0.043)	(0.108)	(0.091)
Return on Assets(–1)	0.036**	0.067**	0.051*	0.099*	0.111*	0.087
	(0.013)	(0.024)	(0.026)	(0.048)	(0.055)	(0.061)
Non–Core Liabilities	0.157**	0.242**	0.247**	1.589**	1.589**	1.394**
	(0.018)	(0.054)	(0.069)	(0.195)	(0.240)	(0.112)
Non–Core Liabilities(–1)	–0.169**	–0.248**	–0.245**	–1.424**	–1.499**	–1.331**
	(0.022)	(0.055)	(0.067)	(0.250)	(0.231)	(0.099)
GDP Growth	0.003	0.007	0.007	0.006	–0.042	–0.017
	(0.003)	(0.009)	(0.008)	(0.012)	(0.027)	(0.024)
GDP Growth(–1)	–0.013**	–0.010+	–0.011	0.001	–0.078	0.000
	(0.003)	(0.006)	(0.008)	(0.022)	(0.049)	(0.023)
Depreciation Rate	0.000	0.004	0.003	0.006	0.004	0.006
	(0.001)	(0.003)	(0.002)	(0.004)	(0.011)	(0.007)
Depreciation Rate(–1)	0.000	–0.001	–0.001	–0.005+	–0.007	–0.005
	(0.001)	(0.001)	(0.001)	(0.003)	(0.008)	(0.006)
Inflation Rate	1.628**	–1.783+	–1.937	–3.928*	–1.47	–0.354
	(0.363)	(1.054)	(1.456)	(1.562)	(2.932)	(2.279)
Inflation Rate(–1)	–1.545**	1.168	1.007	2.806*	4.634	3.636*
	(0.254)	(1.040)	(1.661)	(1.091)	(3.218)	(1.801)
Cost of Loans	0.016**	–0.018+	–0.019	–0.040*	–0.015	–0.004
	(0.004)	(0.011)	(0.015)	(0.016)	(0.029)	(0.023)
Cost of Loans(–1)	–0.015**	0.012	0.01	0.028*	0.047	0.037*
	(0.003)	(0.010)	(0.017)	(0.011)	(0.032)	(0.018)
Total Loans	0.558**			–0.107		
	(0.034)			(0.275)		
Total Loans(–1)	–0.550**			–0.029		
	(0.038)			(0.251)		
Commercial/Industrial Loans		0.004			0.019	
		(0.015)			(0.024)	
Commercial/Industrial Loans(–1)		–0.003			0.000	
		(0.012)			(0.027)	
RE & Mortgage Loans			0.003			–0.019
			(0.012)			(0.028)
RE & Mortgage Loans(–1)			–0.006			0.011
			(0.009)			(0.015)
Leverage	–0.047**	–0.068*	–0.078*			
	(0.013)	(0.027)	(0.032)			
Leverage(–1)	0.054**	0.082**	0.087*	0.869**	0.931**	0.870**
	(0.011)	(0.029)	(0.034)	(0.081)	(0.082)	(0.030)
Asset growth				–1.381*	–1.563**	–0.835*
				(0.590)	(0.477)	(0.349)
Asset growth(–1)	–0.078**	0.011	0.001	–0.261+	–0.123	–0.245
	(0.026)	(0.085)	(0.125)	(0.148)	(0.232)	(0.187)
AC(1) test: z–stat(p–value)	–2.93(0.003)	–2.82(0.005)	–2.39(0.017)	–2.03(0.042)	–2.74(0.006)	–2.21(0.027)
AC(2) test: z–stat(p–value)	–0.85(0.396)	–0.72(0.473)	0.03(0.979)	0.82(0.413)	0.25(0.806)	–0.25(0.805)
#Observations	295	165	144	295	165	144

Note: standard errors in parentheses (+ $p<0.10$, * $p<0.05$, ** $p<0.01$)

TABLE 4B. VIX regressions (bank asset growth and leverage)

	Asset growth	Asset growth	Asset growth	Leverage	Leverage	Leverage
Volatility Index (VIX)	–0.003	0.006	–0.040	–0.134	–0.200	–0.001
	(0.014)	(0.026)	(0.039)	(0.088)	(0.180)	(0.089)
Volatility Index(–1)	–0.017	0.016	–0.040	0.137	0.051	–0.050
	(0.012)	(0.036)	(0.040)	(0.135)	(0.114)	(0.094)
Liquidity Ratio	0.059**	0.076**	0.029	–0.109*	–0.219**	–0.079
	(0.014)	(0.024)	(0.019)	(0.055)	(0.077)	(0.055)
Liquidity Ratio(–1)	–0.059**	–0.059**	–0.010	0.042	0.163*	0.058
	(0.015)	(0.020)	(0.023)	(0.058)	(0.080)	(0.071)
Return on Assets	–0.039**	–0.046	–0.022	–0.080+	–0.041	–0.079
	(0.011)	(0.030)	(0.029)	(0.044)	(0.097)	(0.087)
Return on Assets(–1)	0.039**	0.064*	0.049+	0.083+	0.106+	0.084
	(0.014)	(0.025)	(0.027)	(0.044)	(0.054)	(0.058)
Non–Core Liabilities	0.159**	0.234**	0.250**	1.579**	1.555**	1.392**
	(0.020)	(0.050)	(0.066)	(0.182)	(0.226)	(0.110)
Non–Core Liabilities(–1)	–0.171**	–0.240**	–0.247**	–1.414**	–1.464**	–1.328**
	(0.023)	(0.054)	(0.065)	(0.236)	(0.219)	(0.097)
GDP Growth	–0.001	0.017	–0.003	0.002	–0.066	–0.017
	(0.004)	(0.016)	(0.016)	(0.016)	(0.049)	(0.040)
GDP Growth(–1)	–0.009**	0.013	–0.003	0.022+	–0.012	0.003
	(0.003)	(0.010)	(0.010)	(0.012)	(0.033)	(0.023)
Depreciation Rate	0.000	0.004	0.000	0.006	–0.009	0.005
	(0.001)	(0.003)	(0.003)	(0.004)	(0.011)	(0.010)
Depreciation Rate(–1)	0.001	0.001	–0.001	–0.005	0.000	–0.006
	(0.001)	(0.002)	(0.003)	(0.003)	(0.005)	(0.007)
Inflation Rate	1.595**	–1.901	–2.082	–3.663*	–1.079	–0.306
	(0.356)	(1.177)	(1.483)	(1.596)	(3.398)	(2.434)
Inflation Rate(–1)	–1.500**	1.338	1.248	2.908**	5.249	3.749*
	(0.284)	(1.116)	(1.678)	(1.076)	(3.435)	(1.829)
Cost of Loans	0.016**	–0.019	–0.021	–0.037*	–0.011	–0.003
	(0.004)	(0.012)	(0.015)	(0.016)	(0.034)	(0.024)
Cost of Loans(–1)	–0.015**	0.013	0.012	0.029**	0.053	0.038*
	(0.003)	(0.011)	(0.017)	(0.011)	(0.034)	(0.018)
Total Loans	0.559**			–0.157		
	(0.035)			(0.251)		
Total Loans(–1)	–0.553**			0.024		
	(0.039)			(0.230)		
Commercial/Industrial		0.001			0.005	
Loans		(0.014)			(0.023)	
Commercial/Industrial		0.001			0.017	
Loans(–1)		(0.011)			(0.034)	
RE & Mortgage Loans			–0.001			–0.02
			(0.012)			(0.030)
RE & Mortgage Loans(–1)			–0.003			0.012
			(0.009)			(0.013)
Leverage	–0.048**	–0.064*	–0.079**			
	(0.013)	(0.026)	(0.030)			
Leverage(–1)	0.057**	0.076**	0.085**	0.867**	0.921**	0.867**
	(0.010)	(0.029)	(0.032)	(0.080)	(0.078)	(0.032)
Asset growth				–1.331*	–1.390**	–0.805*
				(0.527)	(0.396)	(0.321)
Asset growth(–1)	–0.087**	0.024	0.002	–0.254+	–0.084	–0.214
	(0.027)	(0.088)	(0.124)	(0.138)	(0.220)	(0.178)
AC(1) test: z–stat(p–value)	–2.99(0.003)	–2.86(0.004)	–2.47(0.014)	–2.03(0.043)	–2.67(0.008)	–2.30(0.022)
AC(2) test: z–stat(p–value)	–0.62(0.533)	–0.68(0.499)	–0.65(0.517)	0.81(0.419)	0.47(0.636)	–0.39(0.698)
#Observations	295	165	144	295	165	144

Note: standard errors in parentheses (+ $p<0.10$, * $p<0.05$, ** $p<0.01$)

Contemporaneous bank liquidity and bank non-core liabilities, and lagged return on bank assets (ROA) also increase bank asset growth when NCBF is used. The fact that bank asset growth depends on non-core liabilities may lead to a vulnerability of banks to non-deposit sources of lending and potentially create credit and asset booms and lead to financial instability. Table $B shows that these findings, especially the one on contemporaneous non-core liabilities in all regressions, are robust since they hold even when VIX is used as an explanatory variable instead of NCBF.

Contemporaneous bank leverage is negatively related to bank asset growth as expected, but lagged bank leverage has the opposite effect. Hence, even though a lagged positive relationship may indicate possible pro-cyclicality of bank leverage and asset growth, the effect is not persistent. The same results are obtained in Table 4B when VIX is used instead of NCBF.

While the coefficient on lagged total loans has a significant and negative effect on bank asset growth, that on contemporaneous total loans is significant and positive, as expected. The latter could potentially lead to credit and asset booms or exacerbate them and threaten financial stability. The results hold regardless of whether NCBF or VIX is used in the regression.

The coefficient on contemporaneous cost of loans is significant and positive in both Tables 4A and 4B, implying that as interest rate on loans rises, bank asset growth rises, but that on lagged is significant and negative. On the one hand, the former finding may indicate some degree of monopoly power and the ability of banks to pass on higher interest rates to borrowers, presumably if there are few alternative sources of finance other than banks. However, the latter finding indicates that bank asset growth first increases when the cost of loans or interest charged on loans falls, which is possible if the demand for more bank loans initially more than makes up for a lower interest rate charged on loans. In any case, the cost of loans variable does not have a consistent effect on bank asset growth.

As for bank leverage, In Table 4A, NCBF affects bank leverage in a significant and negative and countercyclical way in one regression while Table 4B shows that VIX does not have a significant effect on bank leverage. Evidently, there is no strong and consistent relationship between global liquidity or global risk appetite on the one hand, and bank leverage, on the other.

Contemporaneous bank asset growth has a significant and negative effect on bank leverage, regardless of whether NCBF or VIX is used. This likewise does not raise any red flags as far as pro-cyclicality of bank leverage is concerned.

However, while lagged non-core liabilities have a significant and negative coefficient, contemporaneous non-core liabilities have a significant and positive coefficient in all cases in which it is used as an explanatory variable in the regression for bank leverage. The latter finding implies that bank leverage increases when banks are able to source funding from non-core liabilities, a less stable source of bank funding. This may have adverse implications on financial stability.

Lagged bank liquidity affects bank leverage in a significant and positive way using either NCBF or VIX, but contemporaneous bank liquidity affects bank leverage in a significant and negative way whether NCBF or VIX is used. Even if bank liquidity increases bank leverage initially, it is not persistent.

Lagged bank leverage has a significant and positive effect on bank leverage indicating a degree of persistence in bank leverage, regardless of whether NCBF or VIX is used.

Taken together, the effect of both contemporaneous bank non-core liabilities on bank leverage, given the persistence of bank leverage, may have adverse implications for financial stability.

5. Conclusion

This study examines the channels through which net cross-border bank flows and VIX, working through the domestic banking system, could potentially lead to the creation or exacerbation of credit and asset booms that may threaten financial stability. It uses bank firm-level data for the Philippines over the period 1991-2018.

The study finds that NCBF and VIX tend to lower the cost of loans or the average interest rate on loans, likely through a liquidity effect.

The study finds several channels through which NCBF and/or VIX could potentially lead to the creation or exacerbation of credit and asset booms that may threaten financial stability. These include:

Net cross-border bank flows increase the amount of bank loans to the real estate and housing sector whether a crisis dummy is used or not. Both bank ROA and bank liquidity—the ratio of cash to core liabilities—also increase bank loans to the real estate and housing sector.

VIX, in contrast, does not affect bank loans to the real estate and housing sector. The results in one regression show that the amount of bank commercial and industrial loans increases when VIX is high and risk appetite is low. Perhaps banks tend to push out more loans to this sector to protect their bottom line even when risks are high and risk appetite is low. But this may lead to less prudent lending and financial instability.

Non-core liabilities tend to increase the amount of total bank loans and loans to the commercial and industrial sector, which may contribute to the creation of credit and asset booms here, but do not significantly affect the amount of bank loans to the real estate and housing sector. Similarly, higher levels of lagged leverage and lagged bank liquidity also raise the amount of total bank loans, raising the risk of potential credit and asset booms and financial instability.

As far as bank asset growth is concerned, bank liquidity, non-core liabilities, lagged ROA, and contemporaneous total loan growth increase bank asset growth and also raises the risk of potential credit and asset booms and financial instability.

In terms of explaining bank leverage, a contemporaneous increase in non-core liabilities also tends to raise bank leverage, and therefore, the risk of potential credit and asset booms and financial instability.

The use of macroprudential measures—in particular, monitoring bank non-core liabilities as well as bank liquidity ratio and bank ROA, and lending to the real estate sector, and ensuring that liquidity effects of NCBF do not mask risk and lead to imprudent lending—as well as capital flow management measures, as NCBF affects bank loans to the real estate sector and bank asset growth, is warranted in order to prevent bank credit and asset booms from being created or exacerbated, which may threaten growth and financial stability. Non-core deposits are not as reliable a source of funding for banks compared with core deposits. Non-core bank liabilities consistently affect the amount of total loans and loans to the commercial and industrial sector as well as bank asset growth and bank leverage. Too large a dependence on non-core deposits as a funding source could imperil a bank's financial viability and could generate boom and bust cycles in the economy if this funding source were to suddenly dry up.

While the period considered in this study is pre-Covid, the study may have some insight into how the process just described works in reverse, i.e., when there is a global recession and demand for loans and risk appetite for them are both low. Instead of capital inflows chasing higher yields in emerging markets such as the Philippines, capital will tend to flow out and stop. We have seen how bank lending to the real estate and other sectors has declined since the pandemic hit. Prices of condominiums and other forms of real estate have flattened. Unfortunately, in this case of a physical shock via Covid, the curve that needs to be flattened-the Covid infections curve-has not flattened. Because of this, and despite the Philippines' so-called "strong fundamentals" going into the pandemic, and the deployment of a massive amount of liquidity and the increase in government spending, the Philippines has the worst economic outcomes and prospects in Southeast Asia. When the West experiences a strong recovery, it is unclear that capital flows will come to the country if its own recovery is weak and in stark contrast with those of our neighbors, such as Vietnam. There are limits to what conventional macro tools can do in response to a physical shock. Even though countries deployed these macro tools in the same way and to the same extent, the fact that other countries who managed first to contain the pandemic more effectively and have had better economic outcomes is a lesson for us to learn.

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